California Regional Water Quality Control Board
San Diego Region

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December 13, 2004

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Mr. Richard Chase
c/o Gregory Canyon Ltd.
991-C-404 Lomas Santa Fe Drive
Solana Beach, California 92075

In reply refer to:
LD:06-0024.02:tamac

Dear Mr. Chase:

RE: JOINT TECHNICAL DOCUMENT FOR GREGORY CANYON LANDFILL DATED NOVEMBER 2004

The purpose of this letter is to acknowledge receipt of the Joint Technical Document (JTD) by the California Regional Water Quality Control Board, San Diego Region *("Regional Board")* on November 8, 2004. The current JTD supersedes the previous document submitted to the Regional Board on April 6, 2004.

Based upon our review the Regional Board has determined the JTD referenced above is incomplete. The Regional Board staff has the following comments on the most recent JTD dated November 2004:

1. Figure 14 *vs.* text descriptions of the liner in Appendix H and page C.2-7,

   The information given in the figure and text description of the proposed liner system is inconsistent. The inconsistencies are as follows:

   Bottom Liner System Design

   - **12 oz. Geotextile (p. C.2-7)** *vs.* 8 oz. Geotextile on Figure 14
   - **16 oz. Geotextile (p. C.2-7)** ***vs.* 12 oz.** Geotextile on Figure 14
   - **80 mil HDPE (p.** C.2-7) *vs.* 60 mil HDPE on Figure 14
   - **16 oz.** Geotextile, 9" minimum thickness gravel or equivalent drainage layer, 16 oz. Geotextile & 60 mil HDPE (p.C.2-7) NOT included on Figure 14
   - **12 oz.** Geotextile (p. C.2-7) vs. "geotextile" undefined

Slope Liner System Design

- **80 mile HDPE (p.** C.2-7) *vs.* 60 mil HDPE on Figure 14.

It was the understanding of the Regional Board staff that your most recent liner design would be as indicated in the text description in Appendix H. Please provide us with a revised version of Figure 14 that it is consistent with the text descriptions (found in Appendix H and on page C.2-7 of the current JTD).

2. Revision of Figure 24,

The estimates for the summation of runoff (cfs) are not consistent with the runoff values in the table on this figure. Please double-check the values of this information, revise as necessary and resubmit the figure/table for our review.

Many of the subareas identified for use in your Rational method analysis have been altered. Please provide a written explanation of your rationale for the changes. The Regional Board did note that your revised analysis, in the November 2004 JTD, uses a more recent version (2003) of the San Diego County Flood Control District model.

APPENDIX C-1: SUPPLEMENTAL HYDROGEOLOGIC INVESTIGATION REPORT

This appendix to the JTD was submitted in response to the Regional Board's previously identified concerns regarding the adequacy of the available information regarding groundwater flow conditions beneath and adjacent to the proposed unit. An accurate evaluation of groundwater occurrence and flow is required for design and operation of an effective detection ground water monitoring network capable of intercepting potential releases from the landfill. Groundwater beneath the site occurs within a fracture flow system occupying both un-weathered and weathered bedrock. Multiple well aquifer pumping tests and single well tests were performed in the area of the canyon mouth immediately down gradient of the proposed footprint of the waste management unit (landfill).

Section number, page, and paragraph number references key the comments presented here to the JTD. Quotes from the report are in italic type, and response comments are in normal type.

3. <u>Section 2.1.1 Exploratory Borings, page 3, paragraph 1,</u>

"The static water level was measured at 24 feet bgs, defining the potentiometric surface..." Is this water level measurement considered representative of the groundwater table elevation locally?

"...the Western (tonalite) ridge of Gregory Canyon may act as a groundwater barrier." As drawn on Plate 1, the groundwater barrier is not coincident with the ridge but is close in one area. How accurately is the groundwater barrier constrained by the available data?

4. Section 2.4.1 Variable Discharge Tests, page 6, paragraph 3,

"...there was insufficient groundwater in the fracture flow system to sustain an effective pumping test." Please discuss the reasoning supporting this conclusion. Is it also possible that a lack of significant effective porosity is the reason that no hydraulic interconnection was evident between GLA-A and observation wells GLA-2 and GLA-D?

paragraph 4,

"The observed groundwater response...was erratic.... appeared to be mimicking barometric pressure." This pumping test appeared to produce usable results in only one of the three observation wells monitored. The groundwater level in well GLA-B dropped about 4 inches in response to pumping in GLA-3 over a period of 42 hours. Please provide your opinions as to the implications these data regarding the design and operation of an effective detection monitoring well network for the proposed unit.

5. Section 2.4.1 Variable Discharge Tests, page 7, paragraph 2,

"...the groundwater level in well GLA-12 appears to mimic barometric pressure." There appears to be little or no hydraulic interconnection between the pumping well and this observation well. Please provide a written discussion of your rationale for the apparent lack of connection between the pumping well and GLA-12.

6. Section 2.4.2 Constant Rate Tests, page 7, paragraph 4,

"...., while the groundwater level in GLA-2 appears to mimic barometric pressure, with no discernable responses to the pumping well." Please provide a written discussion of possible reasons for the lack of response and any implications upon the design and operation of an effective groundwater detection-monitoring well network for the proposed unit.

paragraph 5,

"The ground water level in GLA-B steadily decreased...and in GLA-12 the groundwater level decreased..." Of the six pumping tests, this set of wells produced the most notable response in the observation wells. What is your assessment of this situation? Does your evaluation indicate

that this due to the close proximity of the wells involved, the number and/or openness of fractures present, compass directions involved, or other factors?

Have local drought conditions impacted results of the pumping and slug tests, and if so how might the tests have differed under more normal conditions? What would the potential affect upon the proposed groundwater detection-monitoring well network under normal rainfall conditions?

7. <u>2.4.3 Slug Tests, page 8, paragraph 2,</u>

"The groundwater barrier was evident in wells .... The low flow zone extends north into the saddle area..." According to the JTD, groundwater occurrence and movement at the Gregory Canyon site is constrained in part by "low flow zones" and an "extensive groundwater barrier." What provisions are contained within the monitoring well network plan to address potential effects on groundwater flow associated with the groundwater barrier and the low flow zone (*e.g.*, in the area west of the groundwater barrier)?

"...aquifer pumping tests do not show measurable response to pumping at wells GLA-A or GLA-13.... wells (GLA-2, GLA-E and GLA-F) have measurable groundwater, none of these wells were amenable to traditional pumping tests..." Please provide a written discussion of the impacts of the above observations to the design and operation of an effective groundwater detection-monitoring network for the proposed unit.

<u>paragraphs 3, 4, and 5,</u>

Wells used for the slug tests required 18 to 27 days to recover from the evacuation of initial well volumes ranging from 25 to 280 gallons. The wells are described as "recovering wells" (page 9, paragraph 1) although, the observed static water level in well GLA-E required 27 days to recover from the removal of 155 gallons of groundwater. Is this well, or are similar wells, useful for purposes of groundwater detection-monitoring network? In a practical sense, what is considered a minimum recovery rate for goals of the groundwater detection-monitoring network? How much time would be required for a micro-purge sampling event in the monitoring wells tested at this site? Of the wells included in the aquifer pumping tests, how many do you consider suitable for inclusion in the required groundwater detection-monitoring program?

8. <u>3.1.2 Geophysical Analysis, page 10, paragraph 2,</u>

"...it is apparent that groundwater flow in Gregory Canyon point of compliance wells occurs within transmissive fractures, and can be separated into two distinct zones." Will the flow zone(s) in individual wells be identified, using flow meters for example, to aid the groundwater

monitoring efforts? For a Detection Monitoring Program (DMP), monitoring of zones of "highest hydraulic conductivity in each ground water body ...." is required by the applicable regulations [see Title 27, Section 20415(b)(1)(B)(5)].

9. Section 4.0 Discussion, page 14, paragraph 2,

"Hydraulic communication...occurring in a system of interconnected channel-ways within the mineralized vein system of the weathered zone..." This statement implies that zones of relatively high conductivity exist within the weathered bedrock. Can the location of these zones in individual wells be determined and monitored using a dedicated system? Please discuss the feasibility of this type of detection monitoring within the context of Title 27 requirements for DMP [especially Section 20415(b)(1)(B)(5)]. .

paragraph 8,

"The line of wells across the mouth of Gregory Canyon inclusive of GLA-14 and GLA-12 spans two bedrock domains apparently reflecting two degrees of fracture interconnectivity...those wells east of and including GLA-13 all show a response to drawdown of other wells in the group." Pumping and observation wells aligned in linear fashion may be expected to provide only a limited view of overall aquifer flow characteristics. Observation wells are typically arranged in a circular pattern, around the pumping well, to maximize data gathering for fracture flow analysis for all flow directions. Why were other wells located up and down gradient of the presumed point of compliance, *i.e.* parallel to the canyon axis, excluded as observation wells during the pumping tests?

10. Section 4.0 Discussion, page 15, paragraph 1

"This does not suggest that the wells in the low flow zone are isolated from the other wells east of and including GLA –13, since the projected equipotential surface includes all of the well data." The fairly uniform water table elevation in wells across the mouth of Gregory Canyon (see Plate 2) suggests there is good hydraulic interconnection (high effective porosity) between fractures in both the unweathered and the weathered bedrock. Although, the lack of response in observation wells (see table on page 15) during the pumping tests tends to indicate a lack of hydraulic interconnection in fractures across the point of compliance. Please provide a written rationale for this apparent discrepancy?

"While a smaller well spacing in the low flow zone could be utilized ...it is not necessary to place additional wells...to detect contaminant transport because all fractures are recharged from the same source." The adequacy of the proposed arrangement of groundwater detection monitoring wells, across the proposed point of compliance, is primarily dependent upon well spacing and screen location relative to the zone(s) of groundwater flow. If the capture zones of

detection-monitoring wells, located along the proposed point of compliance, do not intersect the flow zones; then a release from the landfill go undetected as it passed through the point of compliance. Can your consultant(s) certify that all flowing fractures within the canyon mouth, down-gradient of the proposed landfill, occur within the zone of influence/zone of capture of one or more existing or proposed point of compliance groundwater detection-monitoring wells?

paragraph 2,

"...GLA-14 is well situated for monitoring the efficacy of the groundwater barrier." This statement seems to imply that GLA-14 might serve a detection monitoring well for a release from the landfill area located to the west of the barrier. Is that the case? Is there monitoring capability available in the proposed groundwater monitoring network which would intercept a release into possible high permeability zones located on the west side of the groundwater barrier? Please provide your written supporting rationale in response to these questions.

"...the two dimensional flow model performed by GLA (1995)..." Does the presence of the groundwater barrier, and low flow zone near the mouth of Gregory Canyon, require modification of the modeling previously performed for the "Analysis of Potential Impairment to Groundwater" (see section B.5.1.1.4 of the JTD)? Does this feature create additional pollutant transport pathways that were not previously evaluated for the analysis of potential impairment? Please provide your supporting rationale, including a discussion of the assumptions used in the model for both the fracture flow and alluvial materials, in your written response to these questions.

11. Section 5.0 Conclusions, page 16, paragraph 1,

"Fracture analysis indicates a strong north-trending orientation..." What is the estimated effective porosity for this fracture system?

"Pumping tests results indicate that the 'canyon wells' provide significantly greater flow rates compared to the western ' saddle wells'..." Please provide a discussion of the hydrogeological characteristics of the areas containing these wells.

"Since the bedrock fracture flow system is charged from the same source, all of the proposed groundwater monitoring wells sample the same groundwater, and as a result the groundwater monitoring network will provide chemical evidence of contaminant transport..." Although the aquifer may be *"charged from the same source"*; the groundwater detection-monitoring network, located in a fracture flow aquifer, will be unable to sample groundwater flowing in fractures not intercepted by a monitoring well. In a fracture flow environment, a release can migrate within discrete flow zones; therefore it is necessary that the monitoring well network draw groundwater

from all fractures that might transport contaminants. Can your consultant certify that one or more of the proposed monitoring wells tap all potential contaminant transport pathways?

12. PLATE 1,

Typically, observation wells would be located in a circular pattern with respect to the pumping well thereby providing flow data for fractures oriented in multiple directions. The pumping and observation wells, incorporated in the pumping tests discussed in this JTD, are essentially arranged in a straight line across the mouth of Gregory Canyon. Thus, it appears that flow in only two directions is addressed. It appears that none of the observation wells monitored during the pumping tests discussed in the JTD were located upgradient or downgradient from the pumping well in a direction parallel to the canyon axis. This situation seems odd since evaluation of flow potential to the point of compliance wells from the area of the canyon axis is very important for purposes of establishing an effective detection-monitoring well network.

13. Results of Aquifer Pumping Tests,

In several cases the plotted data does not conform well to type curves or does not describe a straight line. Please discuss the possible reasons for these discrepancies and how potential usefulness of the data may be negatively affected by these results.

Use of Theis pumping test solution methods typically requires that the pumping and observation wells fully penetrate the aquifer. Since wells at Gregory Canyon apparently do not meet this requirement, were modifications applied in order to interpret pumping test data using Theis solutions? How do you expect these results would compare with test data that might have been derived from fully penetrating wells? Please provide a written response to these questions.

If you have any questions regarding this letter, please contact Ms. Carol Tamaki at (858) 467 – 2982 or via e-mail at **ctamaki@waterboards.ca.gov.**

Sincerely,

JOHN R. ODERMATT, Senior Engineering Geologist
Land Discharge Unit

JRO:cat

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